

Design and application of agricultural guarantee digital system platform

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Abstracts: It is obvious that the modern agriculture needs the support of modern finance. The agricultural credit guarantee system, is an important means to promote the financial capital into the agriculture industry, and to solve its financing difficulties and its high cost. The designing and application of agricultural guarantee digital system platform will not only be beneficial to accelerate transformation and promotion of the mode of agricultural development, but also be positive significance on the steady growth, promoting the reform, restructuring and livelihood. This paper summarizes the relevant literatures on agricultural guarantee system, designs and develops a set of agricultural guarantee digital system platform based on the application of blockchain and big data technology, and finds it achieves a lot of benefits and good effects based on the practice in China.

Keywords: Blockchain; Big Data; Sgricultural Guarantee; Digital System

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1 Introduction

Chinese agriculture is characterized by a low overall scientific and technological quality, backward production and management mode, small scale efficiency, long growth cycle, low reproduction rate of agricultural product processing and reproduction, short agricultural industrial chain, and high risk of agricultural management, which leads to a reverse cycle between agricultural development and the shortage of agricultural labor and capital. Due to the idiosyncratic nature of agricultural production, compared with other loan subjects, it is more difficult for agricultural business subjects to obtain loans from the normal financial institutions in China. To establish an agricultural credit guarantee system is an effective measure to solve this problem. Based on the reviews on the construction and application of agricultural credit guarantee system by

the domestic and foreign scholars, this article studies the policies and practices of the system, based on the application of block chain technology, designs and develops an new agricultural guarantee system platform. This agricultural credit guarantee system is widely spread in China and have been achieved much more.

2 Reviews

As early as 1980s and 1990s, the foreign scholars conducted systematic research on credit guarantee theory and formed a complete set of credit guarantee theory. Compared with the domestic scholars, the foreign scholars have more in-depth and mature research on credit guarantee theory. Because the information asymmetry and the moral hazard is existed widely in the credit market, especially in the rural financial market, the rural agricultural operators are more difficult than ordinary enterprises to rely on their own credit to obtain loans. Therefore, simply relying on the market mechanism cannot solve the above situation. The rural financial market needs to introduce third-party agricultural guarantee institutions to reduce the losses caused by moral hazard and information asymmetry. The basic consensus is that the existence of moral hazard and information asymmetry leads to the financing difficulties in agricultural industry. Hoff and Stiglitz (1990) believed that the loan difficulty between farmers and rural financial institutions is caused by adverse selection and moral hazard, which are caused by information asymmetry. Similarly, Stiglitz and Weiss (1992) also believed that the adverse selection and moral hazard caused by information asymmetry between farmers and rural financial institutions are the main causes of financing difficulties for farmers. The introduction of credit guarantee institutions can effectively alleviate the problem of information asymmetry and reduce financing costs. Akerdf (1970) proposed the theory of credit guarantee based on the problem of information asymmetry, and pointed out that the problem of information asymmetry could be eliminated through credit guarantee. Stiglitz and Weiss (1992) believed that only the establishment of agricultural credit guarantee system can alleviate the financing difficulties of agricultural enterprises. Chan and Kanatas (1985) studied the signal transmission of guarantee in the credit market with asymmetric information, and analyzed and predicted that guarantee was widely used in bank loans and small business loans in the "middle market". Barro (1976) explained that how the credit guarantees play a key role in financial markets in terms of interest rates, transaction costs and loan size. Zecchini and Ventura (2009) also stated in their research on Italy that government guarantee can significantly reduce the financing cost of insured companies.

3 Study on the agricultural guarantee digital system

The measures to strengthen the construction of agricultural credit guarantee system in China are inspired from the current situation of finding and solving the problems in the rural financial market, and arousing the urgent need for rural financial innovation. In this paper, the reasons for the construction of agricultural credit guarantee system and the research on the construction of agricultural credit guarantee system is summarized as follows.

3.1 Problems in the rural credit market in China

The Chinese rural financial market is objective deficiency. Many Chinese scholars' researches show that the contradiction of supply and demand structure, the credit line structure and credit term structure in rural

financial market are the main problems existing in the current rural financial market in China. There is a structural contradiction between supply and demand. According to the research of Cao Zehui et al. (2012), rural financial institutions are unable to effectively meet the financing needs of large projects due to their low social recognition and reserve absorption capacity, small operation scale and weak financial supply capacity. Wang Zhicai et al. (2006) believed that with the reform of the financial institution system, the business focus of state-owned commercial banks has gradually shifted to cities, and it leads to the loss of rural capital. Zhang Jianning (2012) studied the restricting factors of agricultural cooperatives and indicated that the single financing channel and limited financing amount of agricultural cooperatives were important factors restricting the development of current cooperatives. In the Chinese rural financial market, the structural contradiction of the credit line is mainly manifested in the fact that the standard linked to the credit rating, guarantee, mortgage and insurance can not meet with the loan demand of farmers. Ren Le et al. (2017) found that agricultural insurance could alleviate the difficulty of credit rationing for farmers through the Logit and Tobit regression model analysis, increase the availability of agricultural credit for farmers and increase the loan amount. Liu Lin (2018) believed that current commercial banks generally calculate the theoretical value of credit limit by high-quality collateral or guaranteed credit line provided by customers according to the operation characteristics of small and micro enterprises. Liang Hu et al. (2019) used multinomial Logit model to propose that external constraints such as the lack of rural financial services imposed by financial institutions which lead to contradictions in the term structure of credit that farmers find difficult to obtain loans from rural financial institutions or full loans. Liang Hu et al. (2019) believed that rural household loans were mainly used for agricultural production and operation, and the loan demand scale was small. The expected loan term is mostly medium-term loans, while the credit products provided by the current rural financial market are difficult to meet the loan demand of rural households. Yuan Chunsheng (2014) showed that the credit financing cost of politically connected companies was lower and it was easier for them to obtain long-term loans.

3.2 Idiosyncratic problems in rural credit

The idiosyncratic problems in the rural financial credit market mainly come from the idiosyncratic risks of agriculture itself and the management risks of agricultural operators. Agriculture itself idiosyncratic risk. Zhang Wei et al. (2014) believe that natural risk and price risk are the main risks faced in the process of agricultural production. Under the dual influence of natural environment and market in agricultural production, the risk of agricultural financial products is far greater than that of other similar types of non-agricultural loans, which makes the conditions and loan amount of rural financial institutions to provide loans to farmers more stringent, resulting in the difficulty of rural financial market loans to meet the demand. Farmers and low income consumers are the main consumers of agricultural economic losses. Wu Wei et al. (2017) believed that the liquidity of agricultural risks made the most vulnerable groups bear the consequences of risks. And the rural information backward status made the rural financial market participants lack effective risk prevention methods. Zhang Yanyuan et al. (2016) believed that in addition to the natural risk of force majeure, the new agricultural operators may also faced more market risks, technological risks and social risks. Therefore, the traditional risk response measures can not fully meet their needs to cope with the risk impact. The main reasons why Chinese agricultural producers cannot obtain loans from the financial market are the large number of agricultural producers, the weak economic strength and the lack of hypothec property. According to Wu Yuxiang (2012), insufficient collateral in rural areas is an important reason which

affects the scale of agricultural operation and the level of agricultural production efficiency, and is also the fundamental reason that agricultural operators are unable to obtain financing from the rural financial market. Liang Hu et al. (2019) believed that the poor economic strength of farmers and the lack of effective mortgage and collateral made it difficult for them to meet the requirements of risk control of financial institutions, which were important reasons for the automatic reduction of agricultural credit supply by rural financial institutions. Dong Xiaolin et al. (2008), after analyzing the current situation and reasons of the difficulty of loans for agricultural management subjects in China, concluded that the key factors to improve the restriction of farmers' access to loans is to solve the mortgage guarantee problem, which should be solved from the perspective of system.

3.3 Construction of agricultural credit guarantee system

The construction of agricultural credit guarantee system is an effective measure to solve the problems of "difficult loan", "expensive loan" and "slow loan" in the current rural financial market. Theoretical research on agricultural credit guarantee system. Qin Hongsong (2014) believes that under the current rural financial system, the guarantee loan for farmers is an effective guarantee for farmers' loans. Zhao Jinlu et al. (2011) believe that agricultural credit guarantee is an effective way to relieve the constraints of agricultural credit and the difficulties of farmers' loans. Establishing agricultural credit guarantee system is helpful to advance the process of urban and rural financial integration in China. Li Mingxing et al. (2019) believe that the development of policy-based agricultural credit guarantee business is the innovative extension of current Chinese financial transfer payment, and also the inevitable process of perfecting urban and rural financial system. Qiao Zhen (2013) believes that the key to the deepening of the rural financial and economic development is depend on the construction of agricultural credit guarantee system. Similarly, Zhao Xuejun (2014) propose that the lack of rural credit guarantee system is one of the root causes of farmers' financing difficulties. The construction of agricultural credit guarantee system mainly includes the participation of multiple subjects in operation, the risk sharing, and the ability of financial support for agriculture. Xiao Zongfu et al. (2007) believe that it is necessary to build a multi-level innovative guarantee system with perfect supervision and risk sharing mechanism, to play the role of agricultural credit guarantee companies, and to promote the deepening development of rural financial markets. In terms of multiple participating subjects, Lin Yifu (2001) believe that the establishment of agricultural credit guarantee companies and the establishment of the operation mode of "company + farmer + bank financial institution" could effectively solve the financing difficulties of agricultural operating subjects in China. Dong Xiaolin et al. (2008) believe that the rural guarantee system should be constructed through four operation modes: the establishing guarantee fund, the establishing guarantee company based on leading enterprises, the establishing financial connection intermediary and the establishing agricultural insurance. In terms of risk sharing, Li Zhijun (2010) believes that the introduction of multiple risk-sharing participants to carry out credit default swaps can help reduce the risk loss of participants with low risk tolerance. Ji Qiongliang(2012) research the four kinds of insurance of "Bank Loans and Insurance", "Guarantee Agencies + Insurance", "Trade Finance + Insurance" and "Finance Lease + Insurance" to participate in the small micro enterprise financing model, and think that it can effectively solve the problem of financial institutions reluctant to lend by establishing a comprehensive financing insurance system from the government, the Banks, the guarantee agencies and the leasing companies to share the risk and the profit. Ma Jiujie et al. (2016) believe that the establishing an agricultural credit guarantee system with financial capital injection plays the leverage role of financial capital

and guiding more credit resources into the rural financial market, and could effectively alleviate the financing difficulties of agricultural operators and meet the requirements of financial support for agriculture industry. Zhang Hongwu (2018) emphasizes that it is necessary to give full play to the leading and supporting role of National Agricultural guarantee Company, to promote the construction of agricultural guarantee system, and continuously to enhance the ability of financial support to agriculture.

4 Agricultural Guarantee Digital System

Based on the application of BlockChain and Big Data technology, the agricultural guarantee digital system platform has been designed and developed to realize the digitalization of the whole process of China's agricultural guarantee business, and all contracts and related legal documents have been signed online including the guarantee contract, the credit protect triad, the entrusted maximum guarantee contract, the guarantee the contract, the counter guarantee maximum amount (guarantee, mortgage, pledge), the counter guarantee contract (contract of guarantee, mortgage, pledge), the commenting the resolution, the notice of loan, the guarantee confirmation letter, etc., with the adoption of a series of electronic signature and the file encryption technology and ensure to provide users with a complete and reliable electronic signature, electronic evidence chain. After registration, the users need to carry out personal real-name authentication and enterprise identity authentication. After authentication, the authoritative digital certificate issuing center will issue the digital certificates for the users to ensure that the electronic signature is exclusive. With the user's account and password, the dynamic SMS and the email verification code, it can ensure that the user's signature operation is only controlled by the user. By the CA signature from State Authority Center, the signed document with the hash fingerprint will eventually signed completely and deposited certification in the notary office to witness, to ensure that the file once being tampered can be found, and provide rapid certification service to ensure the legitimacy of the signature. The agricultural guarantee digital system platform based on blockchain and big data technology fully adopts the architecture design of enterprise-level system, and has the technical characteristics of openness, advanced nature, scalability, reliability, efficiency, correctness, security, maintainability, ease of use and so on. The functions of the agricultural guarantee digital system platform includes the job portal management, the online examination and the approval management, the customer management, the project management, the preliminary acceptance of the project management, the contract management, the cooperative bank management, the cost management, the records management, the electronic contract management, the reporting system and the external system integration platform, the mobile phone client APP, the big data cockpit, the intelligent risk control system, etc.

5 Application of Agricultural Guarantee Digital System

Hunan Province's Agricultural Credit Financing Guarantee Co., Ltd. was reorganized and established in March 2017. This company provides the financing guarantees for Hunan province's "three rural" services, including the agricultural production such as the agriculture, the forestry and the fishing production and the farm construction, and the integration project of agricultural production in agricultural industry such as the providing the agricultural supplies, the agricultural technology, the agricultural machinery, the agricultural products acquisition, the storage and preservation, the sales, the pretreating, and the new forms of agricultural business and other services. This company highlights the support for the production of grain, the live pigs and

the other important agricultural products. This company is the largest agricultural guarantee institution in this province, and has 14 branches in the province with the services covering all counties and urban areas.

The Agricultural Guarantee Digital System optimizes the business approval flow for Hunan Province's Agricultural Credit Financing Guarantee Co., Ltd. and digitizes the whole process of Guarantee business to improve the company's business efficiency and management level. The system could intergrate the existing business system data to make the data be correct, and set up the data warehouse to provide data for reports and big data cockpit, and realize the enterprise several with data analysis in a visualization real-time monitoring for different roles which provide a strong support for enterprise decision-making.

Hunan Province's Agricultural Credit Financing Guarantee Co., Ltd adopts the Agricultural Guarantee Digital System to solve the problems of difficult and expensive financing for new agricultural operators, focusing on solving the problems of difficult and expensive financing for new Agricultural operators. This system contribute much more to promote the economic development, the advancing agricultural supply-side structural reform, and the boosting of the implementation of the "rural revitalization strategy".

6 Conclusions

6.1 Save time and reduce costs

In the case of the continuous growth of business scale, if the business' operation still be used by manual handling, the human cost will also continue to increase. With the application of the digital management platform for agricultural guarantee business, many simple, mechanical and repetitive works such as the data verification, the forms filling and the summary calculation will be automatically completed by this system, which will free the existing personnel from heavy work and effectively save the cost of human resources. With the application of digitalization of contract management, the cost of travel on guarantee business and the threshold of guarantee funds will be reduced, to make more farmers can participate and enjoy the welfare brought by national policies

6.2 Improve ability of compliance management

The agricultural guarantee business work has high compliance requirements. There are many problems such as unclear business rules and poor information communication in manual service processing. With the digital management platform for guarantee business, the business process can be digitized that the business rules can be solidified into the system, and the high business compliance level can be effectively improved, and the compliance risks can be prevented.

6.3 Improve the level of business data management

It will not be convenient for statistics and consulting while the company's business data are saved in the form of documents or paper files. And it will be time-consuming and difficult to guarantee. if the data transfer method is basically manual copy and paste. The construction of guarantee business management system has

realized the digitalization of most business data and greatly improved the management level of agricultural guarantee business, and realized the online processing of the core business of the project, promoted the routinization and standardization of the agricultural guarantee business work which will further enhances the risk prevention ability and comprehensively improves the management level. At the same time, the platform can provide timely and accurate data and information for the company's high-level decision-making, and enhance the company's core competitiveness. Therefore, the construction of the digital management platform of guarantee business is highly consistent with the needs of the company's business development which is imperative.

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